

A new species of the genus *Strongylopus* Tschudi from Namaqualand, Cape Province, South Africa (Anura: Ranidae)

by

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ABSTRACT

Strongylopus springbokensis sp. nov. is described from Namaqualand. Adults resemble *Strongylopus grayii*, but can be distinguished on the basis of body proportions and the possession of a unique male call. The advertisement call, male release call and male aggression call are illustrated. Eggs are laid on land where development proceeds to the pretadpole stage without free water. The tadpole is described and the known distribution of this species is presented.

INTRODUCTION

Six species of the ranid genus *Strongylopus* Tschudi, 1838 are presently recognized (Channing, 1981). The genus is believed to have had a southern origin (Channing, 1981) and to have subsequently migrated northwards. The species comprising this genus occupy a range of habitats, from natural forest through grasslands to semi-desert.

S. grayii (Smith) is found from the Cape to the Limpopo. It is a pioneering species, frequently found in man-made habitats like dams and ditches, even breeding successfully in refuse pits. *S. fasciatus* (FitzSimons) is a widespread grassland form found from the south eastern Cape into Malawi, Zimbabwe and eastern Zambia. *S. bonaespei* is the replacement name for *S. montanus* (FitzSimons), a form found along the mountains of the south western Cape and the Cape Peninsula. *S. hymenopus* (Boulenger) is found on the upper slopes of the Drakensberg escarpment. *S. wageri* (Wager) is a forest form collected from the uplands of Natal and the Drakensberg escarpment as well as from near Sabie.

During a recent trip to Namaqualand as part of a tadpole survey, the author heard a strange frog call at Springbok and later on the farm Bovlei on top of the Kamies mountains near Leliefontein. Calling males were collected and found to superficially resemble *Strongylopus grayii*. However, morphologically they can readily be distinguished from *S. grayii*. On the basis of a unique advertisement call and differences in morphology this frog is here described as a new species.

DESCRIPTION

Strongylopus springbokensis sp. nov.

HOLOTYPE: A male in the Port Elizabeth Museum collection, PEM A963, collected 10 July 1984 by R. C. Drewes and A. Channing at Springbok in Namaqualand (2917DC). The type locality is a small dam on the southern edge of the town.

PARATYPES: Nine adults (1 female, 8 males) collected at the same time and place as the holotype, housed in the Port Elizabeth Museum (PEM A964-A968) and the California Academy of Sciences (CAS 157517-157520).

OTHER MATERIAL EXAMINED: One adult male from the farm Bovei near Leliefontein, the highest point (alt: 1 530 m) on the Kamies mountains (CAS 157521), and two specimens from 11 km south of Kamieskroon (PEM A 1274-5).

For comparative purposes, 41 specimens of *S. grayii* in the Cape Department of Nature Conservation collection, and a series of 9 *S. grayii* from Kuboos, from the Transvaal Museum collection, were examined. (Localities of these *S. grayii* are shown later). Measurements of 63 *S. grayii* from Natal (Channing, 1979) were compared to the Cape material examined in this study and found to be indistinguishable.

The holotype (Fig. 1) is an adult male with a pale yellowish-brown dorsum in life, with irregular brown markings edged with darker brown. Dorsal surface of the legs barred. A narrow pale vertebral stripe is present in some specimens in contrast to the broad vertebral stripe common in the *S. grayii* material examined from the western Cape. Venter immaculate. In preservative the colours fade but the pattern remains. The head is relatively wider and the leg shorter than *S. grayii*. The ratios of head width/tibia and foot/head width (Fig. 2) illustrate this diagnostic difference. The snout is sharp in profile compared with that of *S. grayii* (Fig. 3).

Males in breeding condition have small sharp asperities along the posterior surfaces of the legs, and marginated fingers giving especially the first finger a paddle-like appearance. Four phalanges of fourth toe free of web.

DISTRIBUTION

The localities of specimens examined and identified as either *S. grayii* or *S. springbokensis* are presented in Fig. 4. The northernmost record for *S. grayii* is a series of animals collected at Kuboos (2816BD) in 1933. This may represent a record of a transient population which moved up the drainage lines from the Orange River during a wet period. Further collecting in the Richtersveld during the rainy season is required. Specimens of *S. grayii* collected at Wuppertal near Clanwilliam (3218BB) are morphologically intermediate between *S. grayii* and *S. springbokensis* in terms of head width and leg length. The advertisement call of the Wuppertal specimens, however, is the typical "click" of *S. grayii*.

S. springbokensis appears to be confined to the mountainous areas of Namaqualand, north of the Knersvlakte and south of the Orange River.

VOCALIZATIONS

ADVERTISEMENT CALL

The male advertisement call (Fig. 5A) consists of a series of two to seven or more notes. Each note has a duration of 0,11 s with a pulse rate of 185/s and emphasized frequencies of 0,8;

TABLE 1.

Measurements of the holotype and paratypes of *Strongylopus springbokensis*. Head length is measured from the angle of the jaw to the tip of the snout; head height is measured at the level of the tympanum. Eye and tympanum are horizontal distances. The foot includes the metatarsal tubercle and the fourth toe, while the hand includes the metacarpal tubercle.

Cat. number	PEM A963 Holotype	PEM A964	PEM A965	PEM A966	PEM A967	PEM A968	CAS 157517	CAS 157518	CAS 157519	CAS 157520
Sex	M	F	M	M	M	M	M	M	M	M
Snout-urostyle	42,0	43,5	41,3	36,2	37,1	39,4	37,3	38,2	36,3	39,6
Head width	16,2	17,5	17,1	15,5	15,7	16,5	15,4	15,6	15,4	16,0
Head length	17,0	16,1	16,3	15,2	15,3	16,0	15,4	15,6	15,2	16,1
Head height	7,6	8,6	8,2	7,0	7,2	7,4	7,7	7,4	7,2	7,0
Eye	4,4	5,0	4,8	4,1	4,4	4,6	4,3	4,7	4,3	4,4
Tympanum	2,5	2,7	3,1	2,7	2,8	2,5	2,6	2,7	3,2	2,7
Tibia	23,0	22,8	22,1	19,6	19,7	21,2	20,0	21,4	19,9	21,2
Foot	32,0	31,4	31,0	27,0	27,7	29,2	27,7	30,5	28,5	30,1
Toe	22,4	22,6	21,2	19,5	20,2	21,0	19,5	21,4	20,5	20,3
Ulna	10,8	10,2	10,4	9,0	10,0	10,1	9,5	10,1	9,6	9,9
Hand	11,1	11,5	11,0	10,0	10,5	10,6	10,0	11,0	10,5	10,5



Fig. 1. Holotype of *Strongylopus springbokensis*, PEM A963.

2,6 and 3,6 kHz. Various emphasized harmonics are visible on the sonagram from 0,8 to 8 kHz. Call duration varies from 0,22 s (two notes) to 1,17 s (seven notes). The calls described were recorded in the field at Bovlei and Springbok with a Uher CR210 cassette recorder.

MALE AGGRESSION CALL

This call (Fig. 5B) was recorded in the laboratory. It is produced when one calling male approaches another calling male. The aggression call consists of a single sharp note with an explosive burst of energy from 0,4 kHz to above 8 kHz, with the highest amplitude between 0,45 and 1,8 kHz.

MALE RELEASE CALL

The release call was recorded in the laboratory. The clasping male continues to utter the advertisement call, while the clasped male produces a long series of squeaking calls (Fig. 5C). Duration up to 3 s and probably more. Emphasized frequencies at 0,8 and 1,2 kHz.

OVIPOSITION

Eggs were first found while locating calling males in a dry stream bed below a dam wall on the farm Bovlei. The initial discovery of a disused rodent burrow serving as a call site was exciting, however, this was soon overshadowed by the discovery of the few hundred eggs found to be lining the burrow walls and floor. Other oviposition sites were subsequently located by tracing calling males, all of which were found with eggs. One such site was between grass roots in a damp crack in a rock pile. This site, like the rodent burrow, was placed about 20 cm above the dry stream bed. The eggs were found during the first week in July, at the start of the winter rain.

CHANNING: A NEW SPECIES OF GENUS STRONGYLOPUS TSCHUDI (ANURA: RANIDAE)

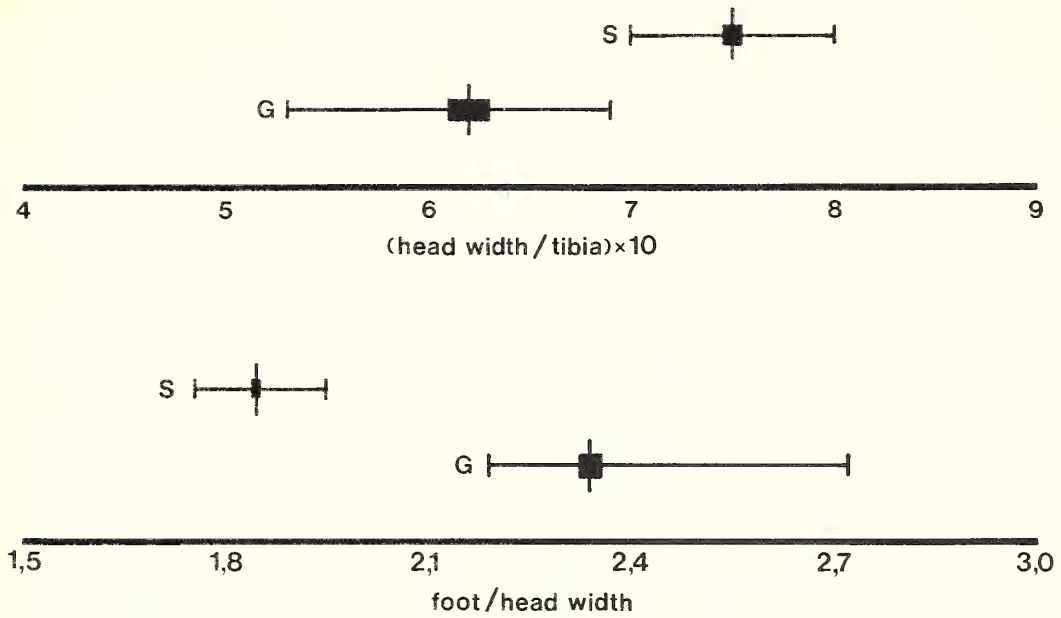


Fig. 2. Comparison of the ratios of head width/tibia and foot/head width. S = *S. springbokensis* (n = 14), G = *S. grayii* (n = 50). Range, mean and standard deviation.

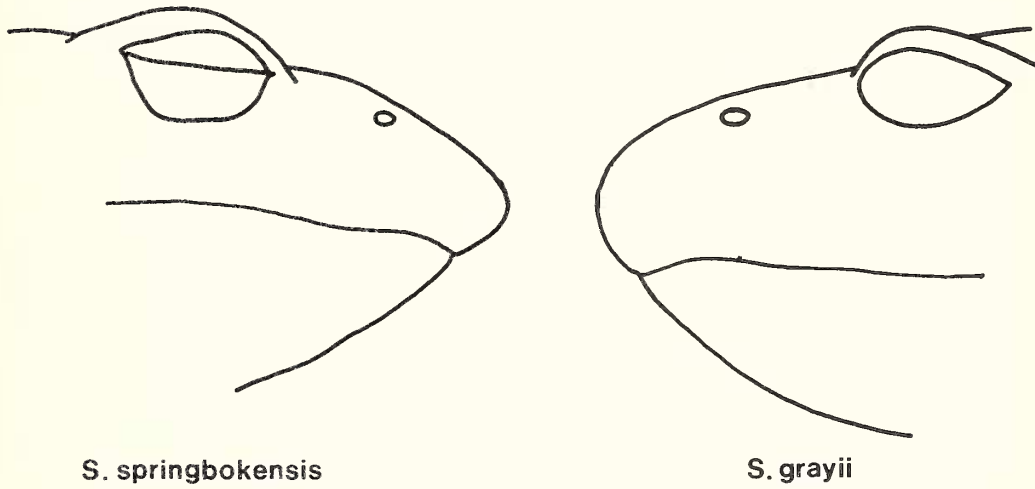


Fig. 3. Comparison of the snout profiles of *Strongylopus springbokensis* and *S. grayii* to illustrate the sharper snout of *S. springbokensis*.

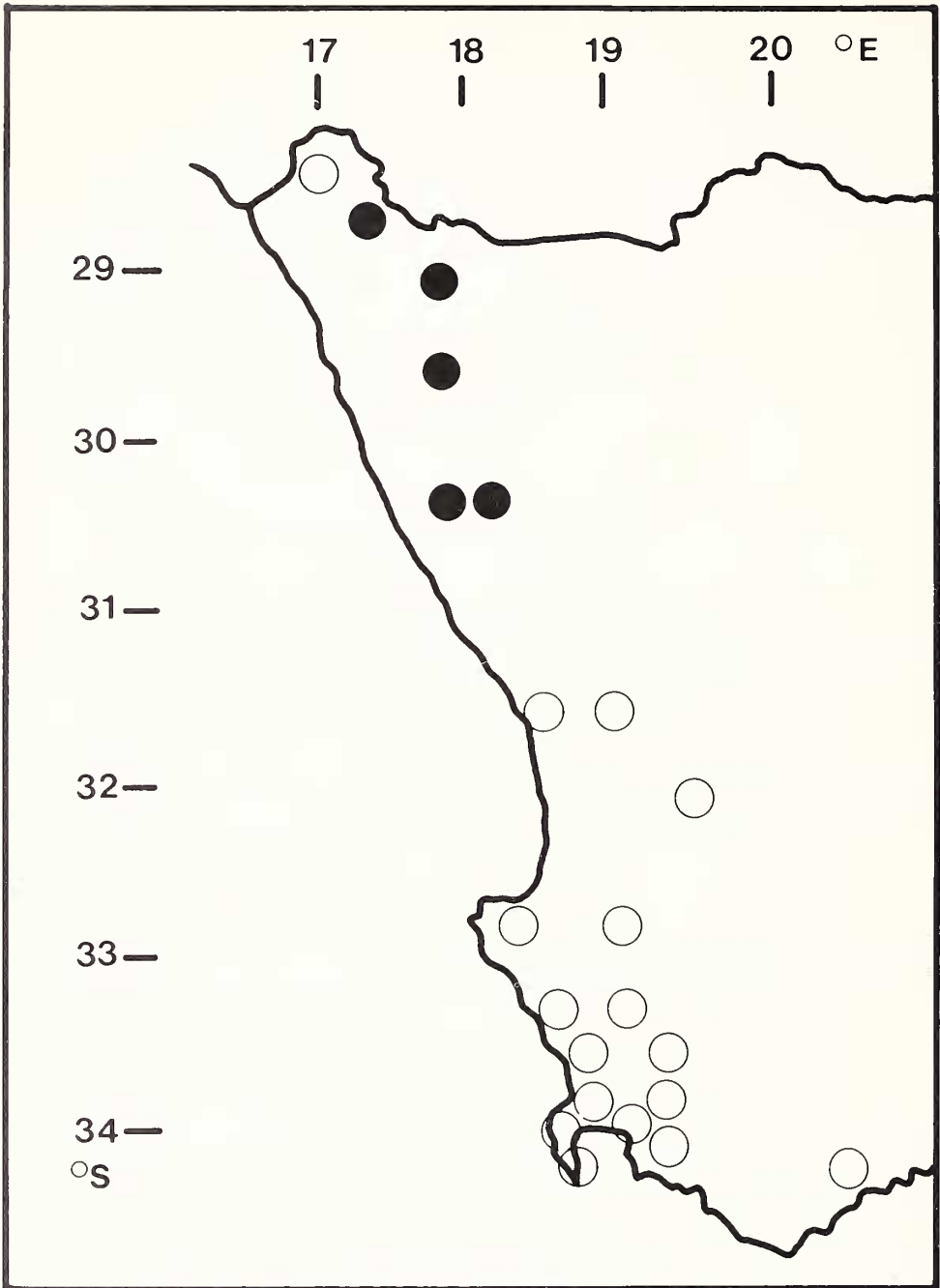


Fig. 4. Localities where *S. springbokensis* (solid circles) and *S. grayii* (open circles) are known to occur, based on material examined in the present study.

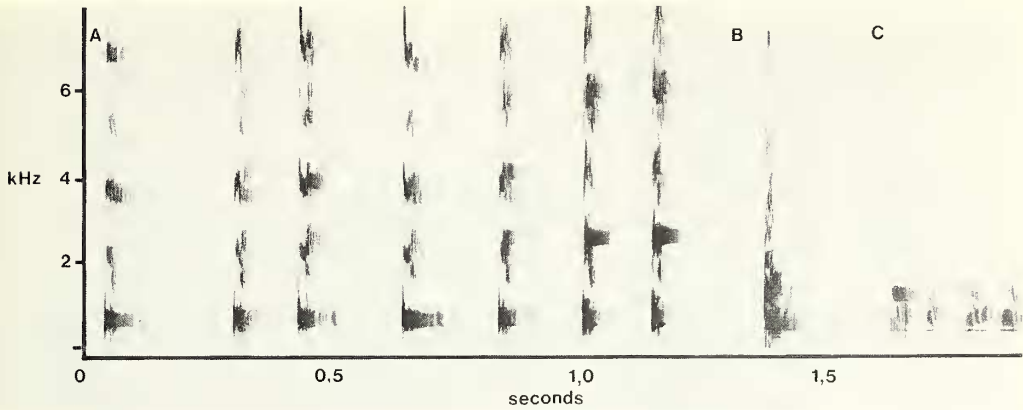


Fig. 5. Vocalizations of *S. springbokensis*. A—The advertisement call. B—The male aggression call. C—The male release call. Sonagrams produced with the wide filter.

A batch of eggs was found near a pool in Springbok in a grassy tunnel 15 cm above water level. Some of these eggs were placed in water immediately; these hatched within 30 minutes into free swimming tadpoles nearly 10 mm long. Part of the batch was kept for a week without water in the damp soil from the burrow where they were collected. When added to water they also hatched within 30 minutes.

From another batch 25 eggs were placed in water and observed under a microscope. They had all reached stage 22 of Gosner (1960) before being placed in water at room temperature and hatched between 20 minutes and 3 hours afterwards. The eggs seem to develop until the eyes and tail are well formed and then to remain at that stage until they are hydrated.

The independence of developing eggs from free water and the rapid hatching of well developed tadpoles soon after water is available seems to be a successful adaptation to life in the arid areas of Namaqualand.

TADPOLE

This description is based on three specimens (length 15 mm; stage 26 of Gosner (1960)) reared from eggs collected at Bovlei.

Mouth situated ventrally, not visible dorsally. Oral disc 0,85 width of head at level of disk. A single row of mental papillae. Suprarostrodont pigmented, serrated across entire margin. Infrarostrodont serrated and pigmented almost to its base.

Keratodont formula 1,3+3/1+1,2 (Fig. 6).

Nostrils sub-circular, rimmed. Opening dorsal, nasal passage only slightly visible dorsally. Width of nostril/internarial distance = 0,19. Rostronasal distance/orbitonasal distance = 0,94. Minute pale pineal spot present. Extra-ocular proportion = 1,5. (See Van Dijk, 1966 for definitions of terminology). Spiracle single, sinistral, visible ventrally but not dorsally, situated 0,65 posteriorly along trunk. Opening slightly constricted, subcircular, visible laterally. Vent dextral, reaching margin of ventral fin.

Tail height subequal to trunk height. Tip rounded. Maximum height of fins occurs 0,2 posteriorly along tail. Tail length/length of head and trunk = 2,0. Height of caudal muscles at base of tail/height of trunk = 0,37.

Dorsal pigmentation uniform brown. Ventrally unpigmented except for slight stippling around the gut coils. Tail muscles slightly pigmented dorsally (Fig. 7). Fins unpigmented, except for slight markings on the dorsal fin.

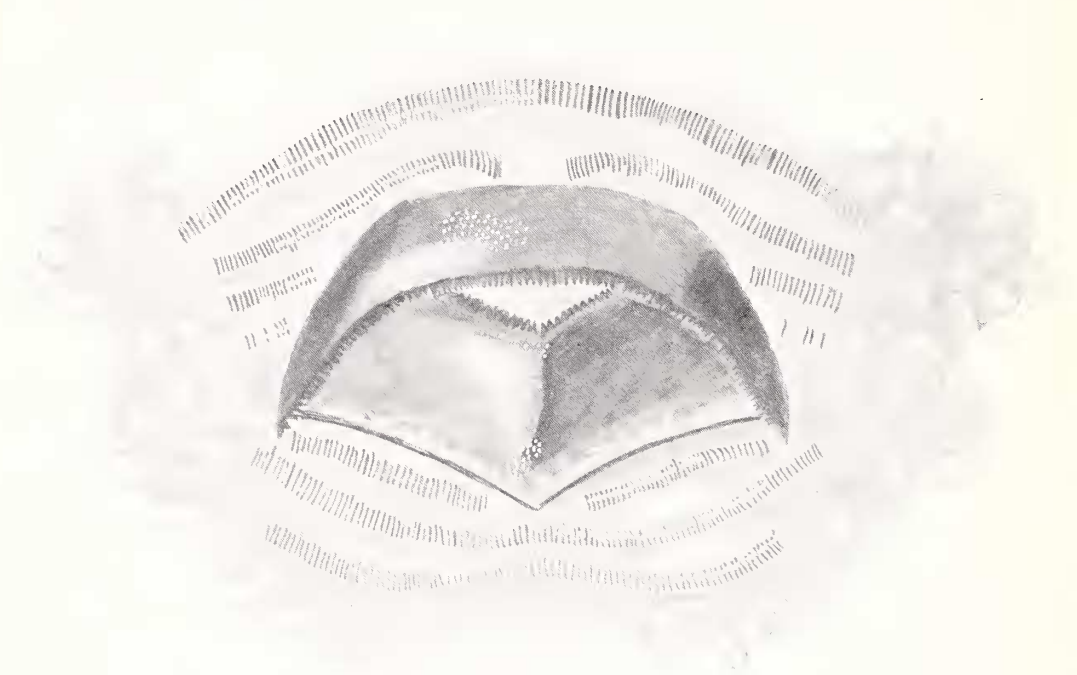


Fig. 6. Mouthparts of a tadpole of *Strongylopus springbokensis*.



Fig. 7. The tadpole of *Strongylopus springbokensis*.

DISCUSSION

The genus *Strongylopus* is believed to have had an origin in the high mountains of southern Africa (Channing, 1981). The Drakensberg massif has been suggested as a moist refuge during interpluvials (Brain and Meester, 1965). The mountains of Namaqualand and the south-western Cape could have served as speciation centres further south. *Heleophryne purcelli*, *H. regis*, *H. rosei*, *Capensibufo tradouwi*, *C. rosei*, *Breviceps montanus*, *Strongylopus bonae-spei*, *S. springbokensis*, and *Arthroleptella lightfooti* are all endemic to the southern mountain ranges, supporting the hypothesis of a southern centre of speciation associated with high relief.

S. grayii and *S. springbokensis* are similar in appearance and presumably closely related. They can be easily separated on the basis of the advertisement call, the long call of *S. springbokensis* being very different from the single click of *S. grayii* (Channing, 1979). Preserved and other silent material can usually be separated morphologically on the sharper snout, wider head and shorter leg of *S. springbokensis*. These proportions can be combined as ratios of head width/tibia and foot/head width to give reliable diagnostic characters. The morphological similarity of the Wuppertal *S. grayii* to *S. springbokensis* remains a puzzle which probably will be solved by a phylogenetic analysis of the group.

The distribution of *S. springbokensis* will only be fully known when museum collections of material presently identified as *S. grayii* (or *Rana grayii*!) have been re-examined and the advertisement calls of the populations checked in the field. Further fieldwork is required to establish the geographical boundaries of the new species and the ecological interactions between it and other *Strongylopus* species, if any.

ACKNOWLEDGEMENTS

Mr Hannes Mostert kindly permitted access to his farm Bovlei where males were first found calling from oviposition sites. E. Baard and A. de Villiers lent material from the Cape Department of Nature Conservation collection. W. Haacke sent specimens of *S. grayii* from the Richtersveld for comparison and W. Branch collected material from Eksteenfontein. W. E. Duellman and J. Frost permitted the author to use a Sonagraph under their control while he was visiting the Museum of Natural History at the University of Kansas. All are thanked for their assistance. Bob Drewes is especially acknowledged for providing an opportunity to visit the type locality and for his enthusiastic help in the field.

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